

## REMARKS

Claims 1-4, 6, 7, 11-16 and 49-53 are pending. Claims 49-53 are new. The previously added new claims 54-63 are canceled.

Claims 1, 2, 6, 7 and 15, as well as claims 49-53 not found in the patent, are amended.

### STATUS OF CLAIMS AND SUPPORT FOR CLAIM CHANGES

1. (Pending) The current amendment to claim 1 is supported, for example, by Examples 4 and 5 and Figure 3 of the specification. Five embodiments of the current invention are disclosed as recombinant gene constructs in Example 4 and demonstrated to synthesize farnesyl diphosphate having a shorter chain length than the native gene in Example 5 and Figure 3 of the specification. Col. 12, line 1 through Col. 14, line 16. The deletion of the comma after “amino acid sequence” is editorial and is performed in order to show the claim amendment as relative to claim 1 in the patent as required by MPEP 1453(IV).

2. (Pending) Support for the amendment can be found in Figure 3, as indicated by the sentence bridging pages 13 and 14 of the Office Action dated February 6, 2007. Compared with Claim 2 (Four Times Amended) presented in the Response filed on June 29, 2007, applicants have replaced “similar conditions” with “identical conditions”.

3. (Pending) The amendment to claim 3 is editorial and supported by the patent claim 3.

4. (Pending) The amendment to claim 4 is editorial and supported by the patent claim 4.

5. (Canceled)

6. (Pending) The current amendment to claim 6 is editorial, supported by the specification at column 6, lines 22-34 and performed as suggested by the Examiner.

7. (Pending) The amendment is supported by Figure 2 and column 13, line 1. Compared with Claim 7 (Two Times Amended) presented in the Response filed on June 29, 2007, applicants have inserted “ and under identical conditions” after “80 °C”.

8-10. (Canceled)

11. (Pending)

12. (Pending)

13. (Pending)

14. (Pending)

15. (Pending) The current amendment is editorial to refer to the “enzyme” as “prenyl diphosphate sunthase” as recited in claim 1 and to delete the redundant “of”.

16. (Pending) The claim dependency is changed to refer to only non-canceled claims.

17-48. (Canceled)

49. (Pending) Claim 49, a claim not found in the patent, is amended from claim 49 presented in the Response to Office Action filed June 29, 2007 by replacing “is modified by” with “is modified by only”. Claim 49 presented in the Response filed on June 29, 2007 differs from claim 49 presented in the Response filed December 22, 2006 in that the claim recitations are recited in active voice instead of passive voice. The recitation “wherein said amino acid sequence modifications consist of threonine modified to phenylalanine at position 78 and histidine modified to alanine at position 81” is replaced with “, wherein the amino acid sequence of SEQ ID NO:1 is modified by replacing threonine with phenylalanine at position 78 and replacing histidine with alanine at position 81”. Support may be found, for example, in the substitution-mutated pBs-SacGGPS plasmid containing SEQ ID NO:9 disclosed in Example 4 and the functional enzyme expressed from the plasmid as disclosed in Example 5 and Figure 3.

50. (Pending) Claim 50, a claim not found in the patent, is amended from claim 50 presented in the Response to Office Action filed June 29, 2007 by replacing “is modified by” with “is modified by only”. Claim 50 presented in the Response filed on June 29, 2007 differs from claim 50 presented in the Response filed December 22, 2006 in that the claim recitations are recited in active voice instead of passive voice. The recitation “wherein said amino acid sequence modifications consist of threonine modified to phenylalanine at position 78 and histidine modified to leucine at position 81” is replaced with “, wherein the amino acid sequence of SEQ ID NO:1 is modified by replacing threonine with phenylalanine at position 78 and replacing histidine with leucine at position 81”. Support may be found, for example, in the substitution-mutated pBs-SacGGPS plasmid containing SEQ ID NO:10 disclosed in Example 4 and the functional enzyme expressed from the plasmid as disclosed in Example 5 and Figure 3.

51. (Pending) Claim 51, a claim not found in the patent, is amended from claim 51 presented in the Response to Office Action filed June 29, 2007 by replacing “is modified by” with “is modified by only”. Claim 51 presented in the Response filed on June 29, 2007 differs from claim 51 presented in the Response filed December 22, 2006 in that the claim recitations are recited in active voice instead of passive voice. The recitation “wherein said amino acid sequence modifications consist of phenylalanine modified to tyrosine at position 77, threonine modified to phenylalanine at position 78 and histidine modified to leucine at position 81” is replaced with “, wherein the amino acid sequence of SEQ ID NO:1 is modified by replacing phenylalanine with tyrosine at position 77, replacing threonine with phenylalanine at position 78 and replacing histidine with leucine at position 81”. Support may be found, for example, in the substitution-mutated pBs-SacGGPS plasmid containing SEQ ID NO:11 disclosed in Example 4 and the functional enzyme expressed from the plasmid as disclosed in Example 5 and Figure 3.

52. (Pending) Claim 52, a claim not found in the patent, is amended from claim 52 presented in the Response to Office Action filed June 29, 2007 by replacing “is modified by” with “is modified by only”. Claim 52 presented in the Response filed on June 29, 2007 differs from claim 52 presented in the Response filed December 22, 2006 in that the claim recitations are recited in active voice instead of passive voice. The recitation “wherein said amino acid sequence modifications consist of phenylalanine modified to tyrosine at position 77, threonine modified to phenylalanine at position 78 and histidine modified to alanine at position 81” is replaced with “, wherein the amino acid sequence of SEQ ID NO:1 is modified by replacing phenylalanine with tyrosine at position 77, replacing threonine with phenylalanine at position 78 and replacing histidine with alanine at position 81”. Support may be found for claim 52, for example, in the substitution-mutated pBs-SacGGPS plasmid containing SEQ ID NO:12 disclosed in Example 4 and the functional enzyme expressed from the plasmid as disclosed in Example 5 and Figure 3.

53. (Pending) Claim 53, a claim not found in the patent, is amended from claim 53 presented in the Response to Office Action filed June 29, 2007 by replacing “is modified by” with “is modified by only”. Claim 53 presented in the Response filed on June 29, 2007 differs from claim 53 presented in the Response filed December 22, 2006 in that the claim recitations are recited in active voice instead of passive voice. The recitation “wherein said amino acid

sequence modifications consist of phenylalanine modified to tyrosine at position 77, threonine modified to serine at position 78, valine modified to isoleucine at position 80, isoleucine modified to leucine at position 84 and proline and serine inserted sequentially between position 84 and position 85” is replaced with “, wherein the amino acid sequence of SEQ ID NO:1 is modified by replacing phenylalanine with tyrosine at position 77, replacing threonine with serine at position 78, replacing valine with isoleucine at position 80, replacing isoleucine with leucine at position 84 and inserting proline and serine sequentially between position 84 and position 85”.

Support may be found for claim 53, for example, in the substitution-mutated pBs-SacGGPS plasmid containing SEQ ID NO:13 disclosed in Example 4 and the functional enzyme expressed from the plasmid as disclosed in Example 5 and Figure 3.

#### **Reissue Oath/Declaration**

The reissue oath/declaration filed on July 12, 2001 was objected to as defective for stating “duty to disclose under 37 CFR 1.56(a)” instead of “duty to disclose under 37 CFR 1.56”. The defective reissue oath/declaration will be corrected by submitting a substitute reissue oath/declaration when, as suggested by the Office Action referencing MPEP 1444.II, the Examiner indicates that the reissue application is in a condition for allowance.

#### **Claim Objections**

Claim 1 was objected to as being not amended *vis-á-vis* the patent claim 1. Claim 1 has been amended, among other things, by deleting “,” after “amino acid sequence” in claim 1 of the patent.

Claim 6 was objected to because of the recitation “a mutant enzyme of *Sulfolobus acidocaldarius*.” Claim 6 has been amended as suggested by the Examiner by replacing the recitation with “a mutant of a *Sulfolobus acidocaldarius* prenyl diphosphate synthase.”

Claim 15 was objected to because of “and of harvesting...” Claim 15 has been amended as suggested by the Examiner by replacing the recitation with “and harvesting...”

Claims 1-4, 6, 7, 11-16 and 49-53 were objected to as being based on a defective reissue oath/declaration. As indicated above, the defective reissue oath/declaration will be replaced with a substitute reissue oath/declaration when the Examiner indicates that the application is in a condition for allowance.

Withdrawal of the objections is requested.

### **Rejection of Claims —Written Description**

Applicants respectfully traverse the rejections of claims 1-4, 6, 7, 11-16 and 49-53 as not meeting the written description requirement of 35 U.S.C. 112, first paragraph. Applicants submit that the specification provides written description for a mutant prenyl diphosphate synthase having the amino acid sequence of SEQ ID NO:1 which can have amino acid modifications **in addition to the modifications recited in claims 1** filed in the Response filed on June 29, 2007 (for instance, see column 4, lines 15 to 34, of US 5,935,832). The amino acid modifications recited in claim 1 represent only examples of the mutants (see column 6, lines 45-63, US 5,935,832). However, applicants note that the mutant prenyl diphosphate synthase according to claim 1 in the Response filed June 29, 2007 does not have amino acid modifications in addition to the modifications recited in claim 1 in the Response because claim 1 in the Response recites: “A mutant prenyl diphosphate synthase having an amino acid sequence **modified** from the amino acid sequence of SEQ ID NO:1 **by:** replacing threonine with phenylalanine at position 78...” (emphasis added). Claim 1 in the Response filed June 29, 2007 does not recite that there can be amino acid modifications in addition to those recited immediately after “modified from the amino acid sequence of SEQ ID NO:1 **by:**” in the claim. For instance, claim 1 in the Response does not recite where else (other than the modifications listed immediately following “modified from the amino acid sequence of SEQ ID NO:1 **by:**”) SEQ ID NO:1 can be modified to arrive at the mutant prenyl synthase according to claim 1 in the Response. Nevertheless, in order to advance prosecution, claim 1 is now amended to recite “having an amino acid sequence modified from the amino acid sequence of SEQ ID NO:1 **by only:**....” (emphasis added). Applicants contend that the current amendment to claim 1 does not narrow the scope of claim 1 in the Response filed on June 29, 2007.

Applicants respectfully traverse the new matter rejections of claims 2 and 16 because Figure 3 provides descriptive support for “synthesizes more farnesyl diphosphate than the amount of farnesyl diphosphate synthesized by the wild type prenyl diphosphate synthase under similar conditions” in claim 2 presented in the Response filed June 29, 2007. However, to advance prosecution, applicants have replaced “under similar conditions” with “under identical conditions”, which the Office Action concedes has descriptive support in the specification.

Applicants respectfully traverse the new matter rejections of claims 7 and 16 because Figure 2 and column 13, lines 1-14 of US 5,935,832 provide descriptive support for “having a higher enzymatic activity using isopentenyl diphosphate as a substrate at a temperature of 80 °C than that of the wild-type prenyl diphosphate synthase ” in claim 7 presented in the Response filed June 29, 2007. However, to advance prosecution, applicants have inserted “and under identical conditions”, which the Office Action concedes has descriptive support in the specification.

Withdrawal of the written description rejections of claims 1-4, 6, 7, 11-16 and 49-53 is requested.

#### **Claim Rejections -- Enablement**

Applicants respectfully traverse the rejections of claims 1-4, 6, 7, 11-16 and 49-53 as not enabled by the specification other than the Mutant enzymes 1-5 recited in claim 1. As explained above, claim 1 in the Response filed June 29, 2007 and claim 1 as amended above are directed to a mutant prenyl diphosphate syntase having the amino acid sequence modified from the amino acid sequence of SEQ ID NO:1 by only the list of amino acid modifications recited in the claims. The Office Action concedes that these mutants are enabled. Withdrawal of the non-enablement rejections is requested.

**CONCLUSION**

The claims are believed to be in condition for allowance and Applicants respectfully request the same. The Examiner is invited to contact the undersigned to discuss any issues related to this application.

In the event that the filing of this paper is deemed not timely, applicants petition for an appropriate extension of time. The Office is authorized to charge any fees, including the extension fee, or credit any overpayment regarding this application to Kenyon & Kenyon LLP  
**Deposit Account No. 11-0600.**

Respectfully submitted,

Date: October 30, 2007

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